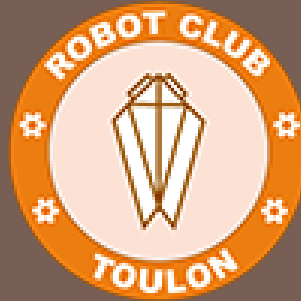


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Upcoming 2020 improvements for RCT team

- Still trying to make a robot able to play games !

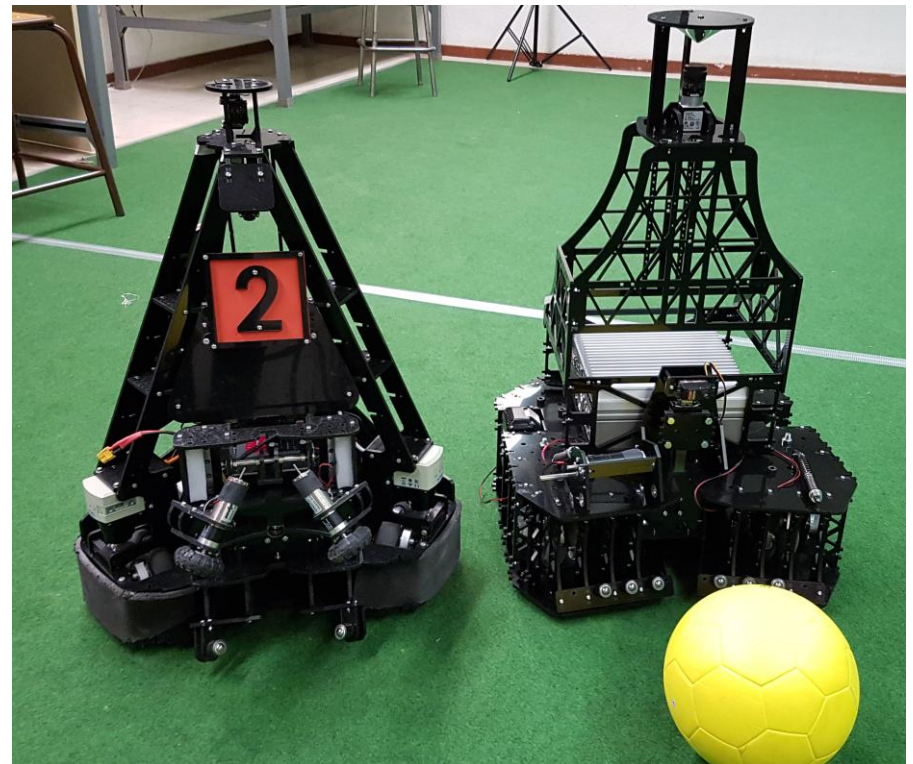
- Learning form other teams...

- New features :

- Improved coil gun.
- Improved propulsion structure
- Reliable embedded processing architecture
- Reliable sensors
 - Cameras
 - Lidars

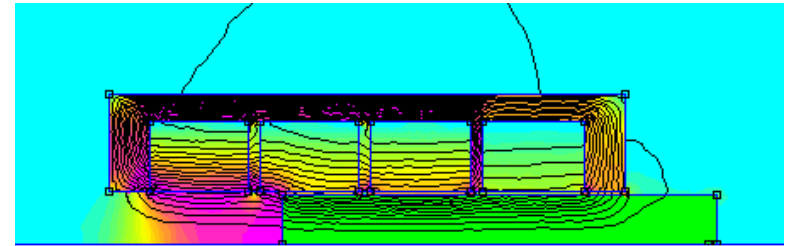
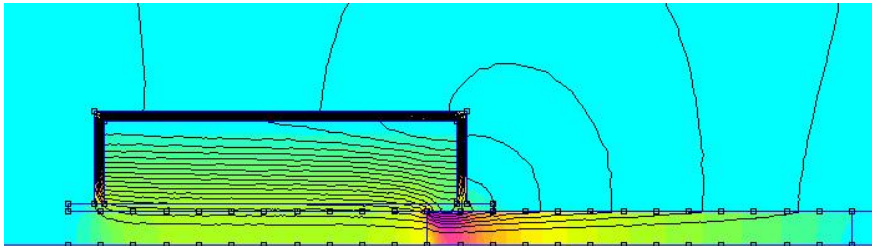
- New robots :

- New ball handling system

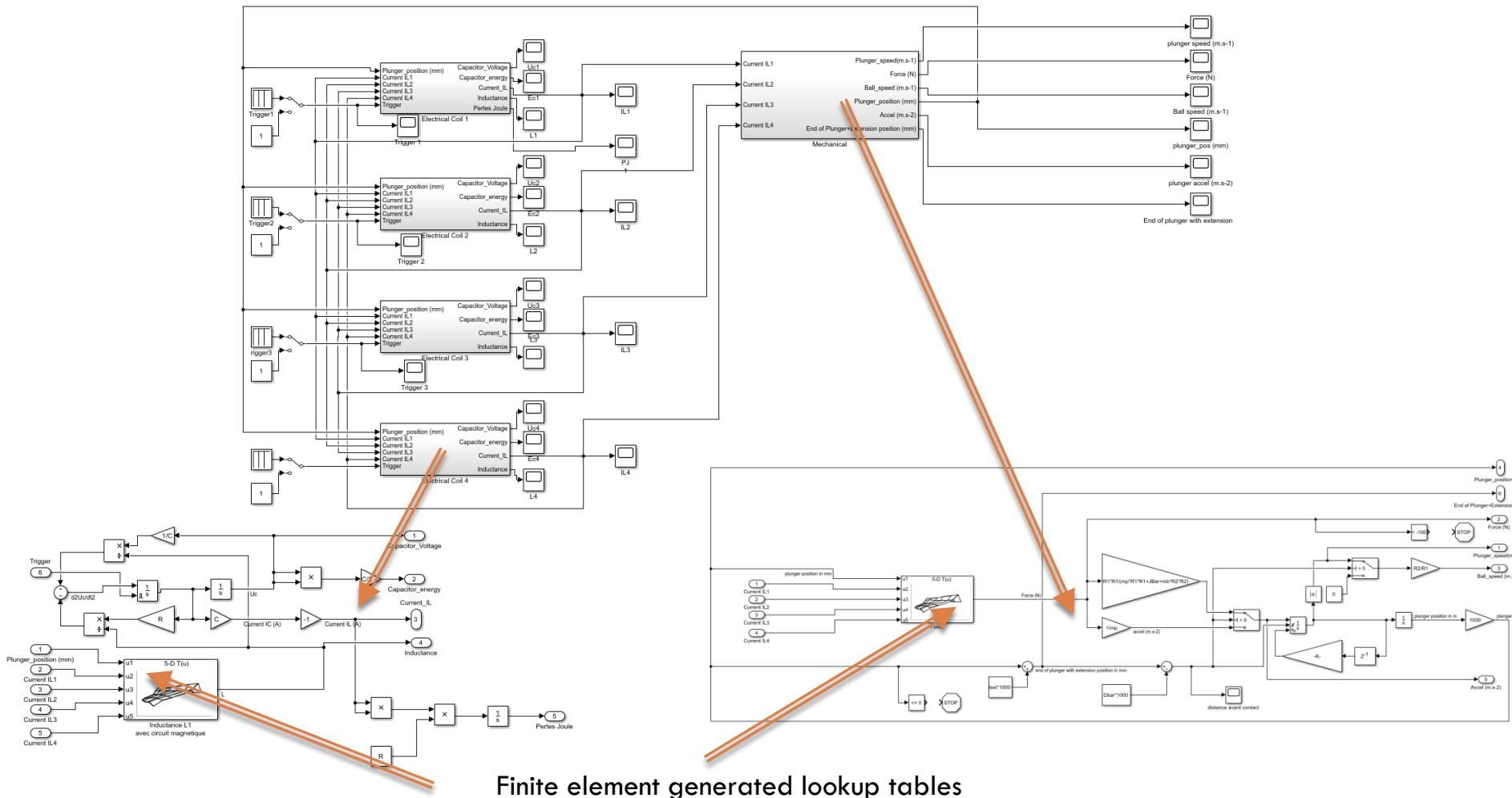


□ Introducing a multi-coil kicking system :

- Same copper weight
 - Old one : 1 coil
 - New one : 4 coils
- Same overall capacitor value
 - Old one : one 4700uF 450V capacitor
 - New one : four 1200uF 450V capacitors



Modelling a kicking system under Matlab Simulink :



Finite element generated lookup tables

□ Power conversion simulations :

■ Capacitor energy : $E_c = 450\text{J}$

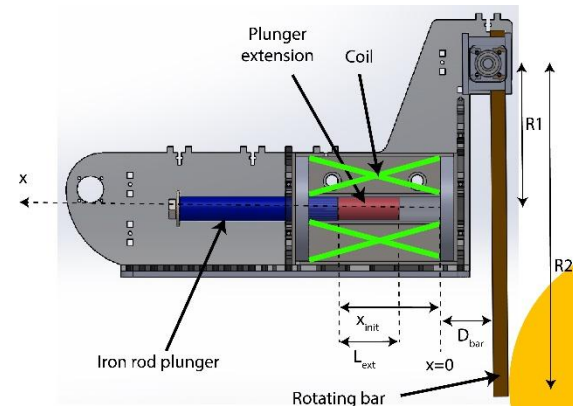
- Equivalent mass for plunger + ball + vertical bar : $0,7\text{kg}$
- Theoretical ball speed in a perfect energy transfer : 35.8m.s^{-1} (126 km.h^{-1})

■ Simulated output ball speed with one coil :

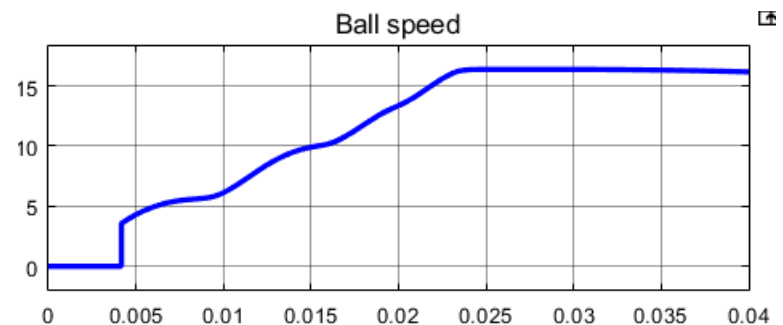
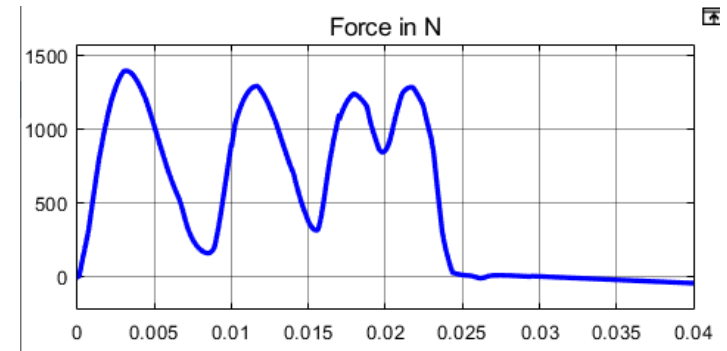
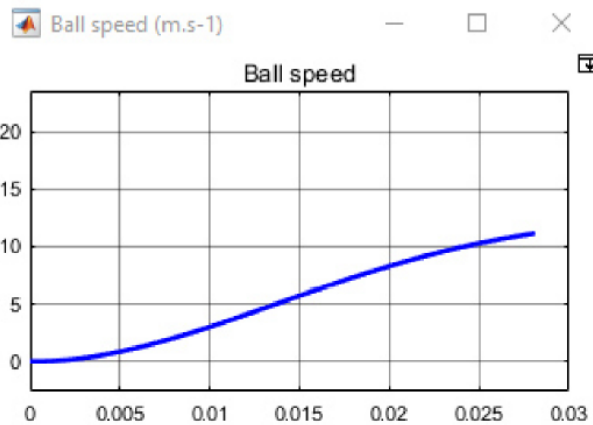
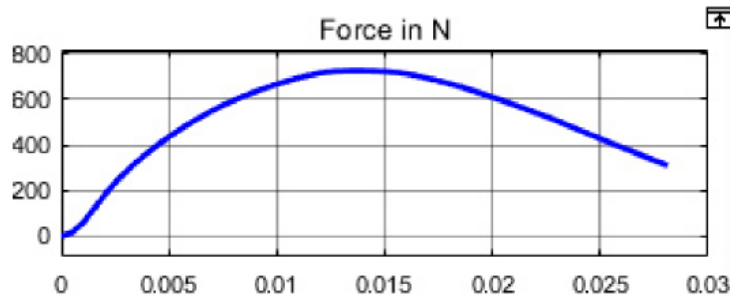
- 11m.s^{-1} (40 km.h^{-1})
- $E_c = 42\text{ J}$
- Energy transfer : 9.3%

■ Simulated output ball speed with four coils :

- 17m.s^{-1} (61km.h^{-1})
- $E_c = 101\text{ J}$
- Energy transfer : 22.4%



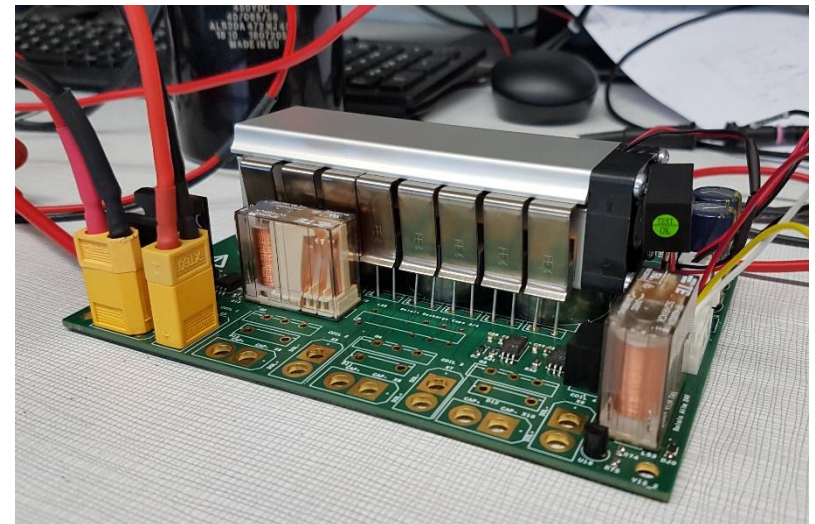
Simulations : One coil VS Four coils



Final speeds : One coil : 11m.s-1 VS Four coils : 17m.s-1

■ Multi-coil kicking system : results

- Hypothesis :
 - No change in copper weight or capacitor overall value
- Results :
 - Improves energy transfer by a factor 2.4.
 - Still to improve (power transfer of only 22%)
- We will use at RoboCup 2020
 - Kicking system PCB operational
 - In production now.
 - Based on TUE circuit
 - Small evolutions for safety in case of short circuits.



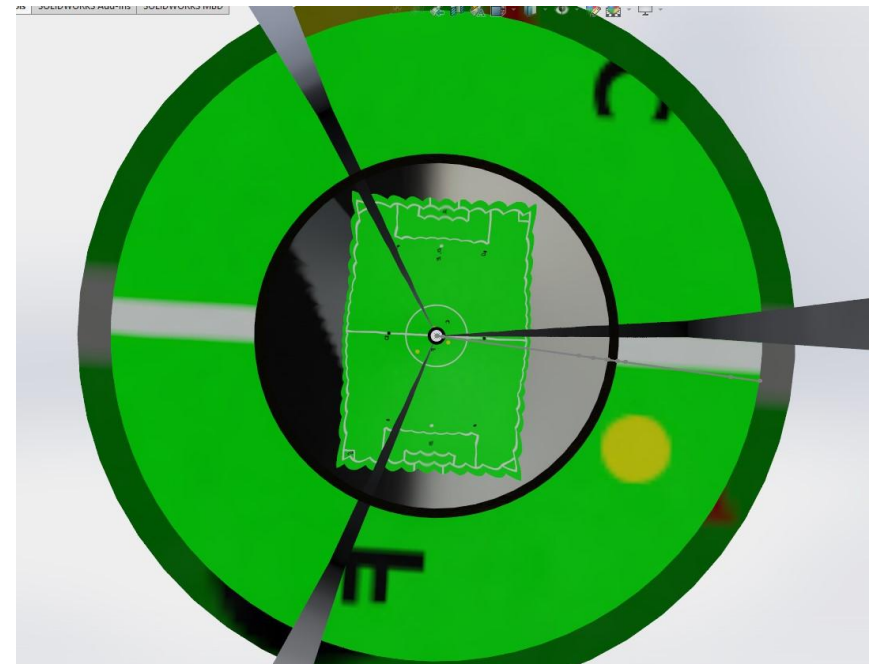
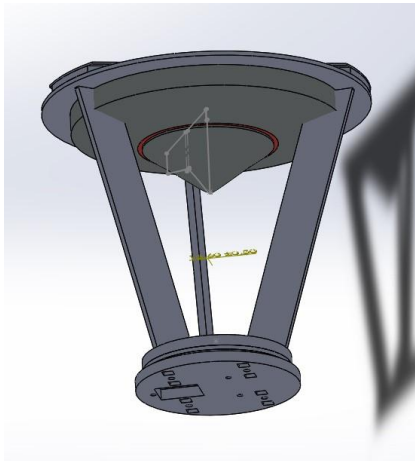
□ Introducing a new omni-directional mirror

■ Evolution of our non distorting mirror

- Already presented in 2019
- A square in the horizontal plane has the same size on the image, whatever its position in the scene.

■ Introducing a bi-foveal mirror

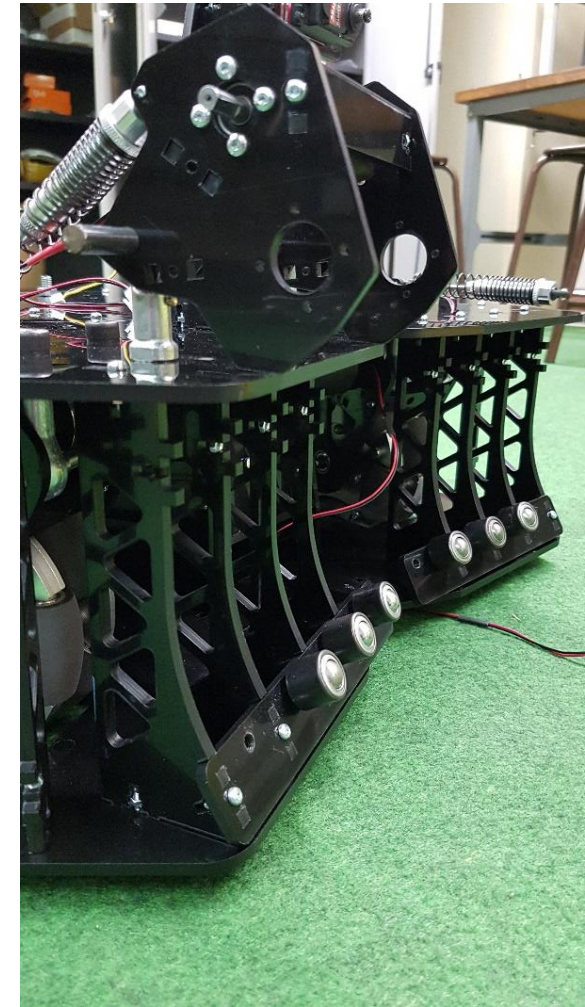
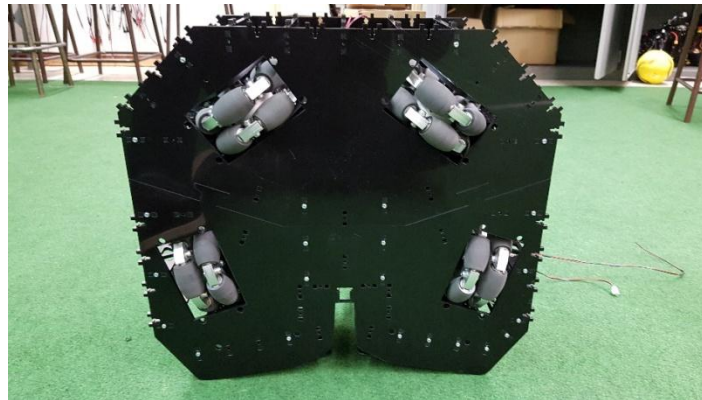
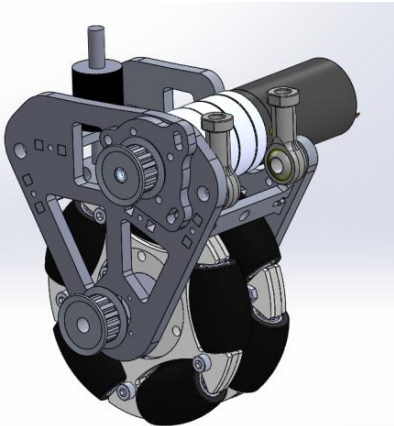
- Double non-distorting mirror
- See the whole field
- See precisely around the robot



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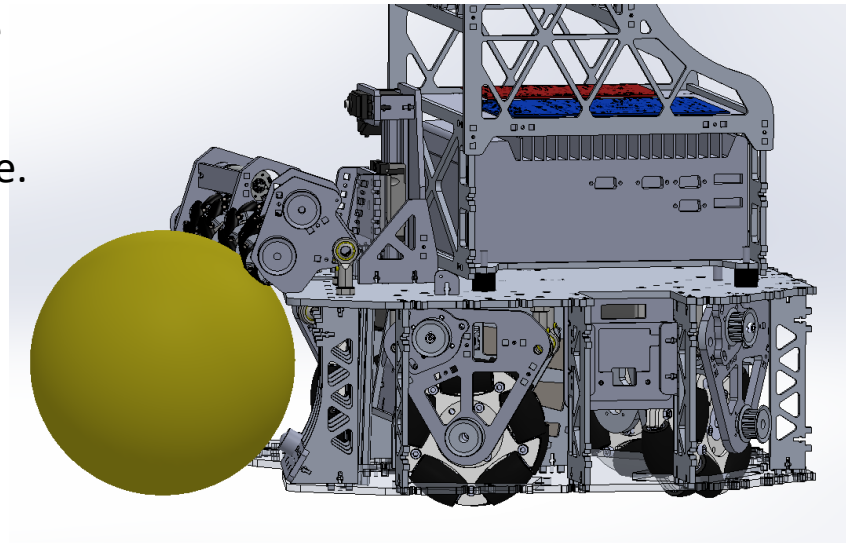
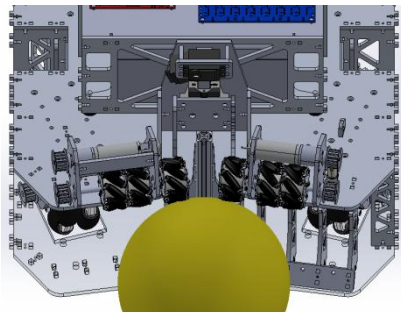
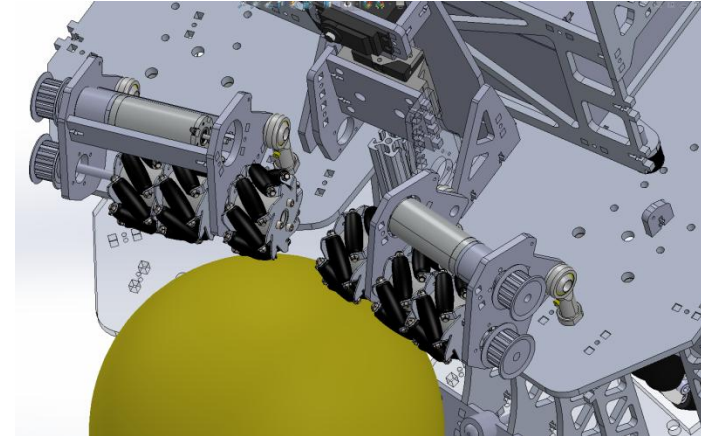
Robot Club Toulon

- Introducing a different robot configuration
 - 4 omni-wheels in a pentagonal structure
 - More power during acceleration
 - Very large free area in front of the robot
 - 144° in a pentagonal structure
 - 120° in a triangular structure
 - A difficulty
 - Hyperstatism due to the fourth wheel
 - Using suspended wheels mounted on rubber.



Introducing a new ball handling system

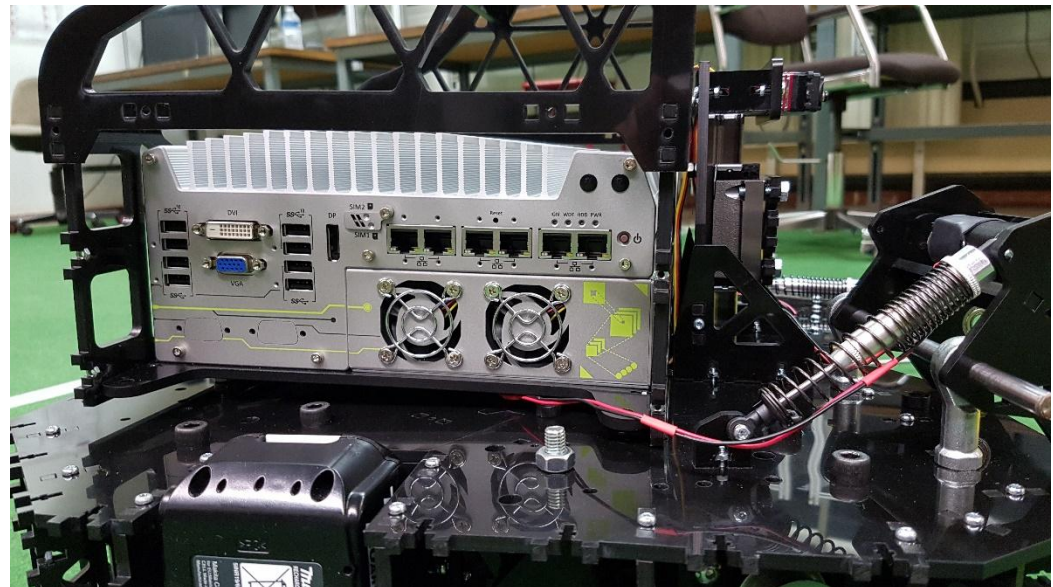
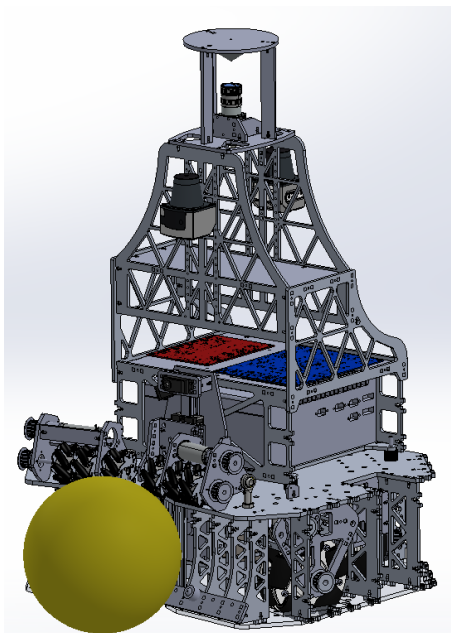
- Large ball handling system
 - Take advantage of the large opening angle of the pentagonal base structure
- Using 6 mecanum wheels
 - Inspired by Water team
 - Grip of the mecanum wheels
 - Auto-centering of the ball
 - Necessary with a wide opening angle
- Has to be tested extensively
 - We will report videos as soon as possible.
 - Instagram : #robotclubtoulon



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Robot Club Toulon

- ▣ Sensor and Embedded system evolution
 - Using GTX 1060 GPU for computer vision (Neousys computers)
 - Using Basler cameras with Gbit Ethernet and PoE.
 - Using Lidars for collision avoidance
 - Studying the possibility of using a 50Hz – 0.014° resolution LIDAR
 - Precision : points every 2.5mm at 10 meters.





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Thanks for your attention

Questions ?